in Colorado Springs, Colorado. Later[1] he added Dotson Reservoir near Fowler, Colorado, to the known localities.

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VAGABONDING FOR SHELLS

BY P. S. REMINGTON, JR. AND W. J. CLENCH

The authors have been impelled to write this article because they feel that they have accomplished something of value to conchology, and because they hope that their account of it may induce others to attempt similar trips. The "expedition" was made under the auspices of the Museum of Zoology at the University of Michigan, the expenses of the trip being borne by the Museum and by Dr. Bryant Walker of Detroit. The greater part of the material collected will eventually go to the collections of the above named. Thanks are due to Dr. Walker and to Mr. Calvin Goodrich for help in the way of advice, suggestions as to the best places to collect, and gifts of maps and other equipment. A formal report of the species collected will come out later.

The purposes of the trip were several. In the first place, we wanted to collect as large a series of Physa as possible to provide more material for Clench's doctoral thesis, which is on the Physa of the U. S. east of the Rocky Mts. We wished to get our Physa in alcohol for anatomical study, for there is a scarcity of such material. Secondly, we were anxious to collect through the Tennessee River system, particularly the upper portion, which neither of us had ever seen, and which is one of the richest collecting fields in the country. We also had a list of various places, furnished us by Mr. Goodrich, which was desirable to collect in either because they were new territory, or because they were the locality of certain doubtful species. Most of these we cleaned up. Last, but not least, we were out to get

[1] NAUTILUS, Vol. 32, 1918, p. 71, and Univ. Colo. Studies, Vol. 13, No. 2, 1924, p. 162.

some Ios. The authors collected shells together as boys, and at that time one of the things we promised ourselves to do some time was to go on a hunt for Ios. This trip promised an opportunity of doing that and of renewing our boyhood memories. Before leaving, Clench prophesied that this year would see the last of the Ios! It wasn't quite so bad as that, but we did succeed in taking several hundred. There are undoubtedly a few left in the French Broad River, which we did not touch. We had carte-blanche as to where we might go, but were guided largely by the above considerations. We left Ann Arbor on July 19 and returned Sept. 8.

In our choice of equipment we were able to profit by the results of a similar trip made the preceding summer by Clench. We bought a 1922 Ford touring car in excellent condition and proceeded to load up the running boards and back seat until it looked like a gypsy outfit. We were handicapped by the fact that we had to carry full camping equipment and supplies as well as the collecting kit. We had a very handy auto tent, two folding cots, two folding chairs, and a folding table. This last was bought because of Clench's experience the summer before, and it was certainly useful. In our grub box we carried cooking utensils and canned food, mainly beans. Both the authors were originally from Boston. We had another large case containing wading boots, sieves, jars, boxes, vials and bags, of which one can't have too many on such a trip. A duffle bag for each of us, a suit case of "civilian" clothes, a dispatch case for papers, a case for toilet articles, a lantern, blanket rolls, water jug, emergency can of gasolene and one of oil, and a container of alcohol filled up the back. We had a very fine two-mantle gasolene lamp which was invaluable. Although the museum appropriation for this trip came largely from the conchology department, we received contributions from the insect and reptile departments, so had to carry along equipment for collecting such specimens. The insect equipment was limited to nets and cyanide jars, but we had to take a large milk can partly filled with formaldehyde to preserve reptiles. The reptiles were put in this to harden and preserve them, then injected and wrapped in gauze and shipped back.

We also had a plant press and a minnow seine. All these things gave us license, when asked our business, to say we were collecting "plants and animals" for the University of Michigan. This was all right till one obliging fellow offered us a pet woodchuck! Then we hit upon the happy phrase "we are making a Biological Survey." They knew what a survey was anyway.

With all this mass of equipment aboard you would say we must have spent half the day packing and unpacking. It is true that it did take us an hour or more for this operation at first, but before long we evolved a system, so that by the end of the trip we could pack in less than fifteen minutes and make camp in less time than that. We were surely a spectacle and got many a kick out of the reactions of the beholders. Vagabonds indeed!

One of the most enjoyable incidents of the whole trip came at the very start. We left Ann Arbor about nine in the morning "heading south." We collected a little, mainly *Physa*, and reached Toledo in the afternoon, where we hunted up Mr. Calvin Goodrich. He very kindly insisted on our putting up with him, so we had an opportunity to inspect his large collection of *Pleuroceridae* and "talk shop." As the catch where we were going would be largely of that family, we wanted all the "dope" we could get. We had a very enjoyable visit, all too short, for, as Mr. Goodrich remarked, it isn't often that three shell collectors get together.

The next day, Sunday, we set out bright and early bound southwest for Bluffton, Ind. We had heard unfavorable news from Mr. Goodrich that all the rivers in the south were swollen from heavy rains, and that unless they went down we would see very little good collecting. Our original intention was to strike south through Cincinnati and Cumberland Gap to the headwaters of the Tennessee River, then work down to Huntsville, Ala. and then north to Louisville. Upon receipt of this unwelcome news, we decided to reverse the itinerary, so as to reach the heavy collecting last, in the hope that by then the rivers would be low. This turned out to be a wise move.

We camped the first night near Hicksville, Ohio, a half-mile off the main road. We can hear the ringing reply, even now,

of the farmer on whose land we asked permission to camp. "You bet your life you can!" he said. We want to say right here that if the camper is neat-appearing and respectful, and leaves no rubbish or disorder of any kind behind him, he will have no trouble finding a place to camp, and we were not once refused in the whole 1700 miles we traveled. It is usually better to go a little off the main road before camping. One should be very careful about water, and we carried a bottle of Halozone tablets which we usually added to the water. Country folk are always hospitable and often brought us out cake, pie and other dainties.

We were sorry to leave the wonderful concrete roads of Ohio, but we had little to complain of in Indiana. There was very little collecting from Toledo to Bluffton. On the banks of the St. Mary's River at Fort Wayne we found some fine *Succinea avara* Say and a few other land shells. At Bluffton we hunted up Mr. E. B. Williamson, the dragon fly expert, and a member of the museum staff. We were cordially invited to make his home our headquarters for as long as we cared to stay in Bluffton. We were glad to stay two days while we rearranged our outfit, supplied what we found lacking, and collected in the vicinity. We found quite a few *Planorbis*, *Physa*, *Polygyra*, *Succinea* along the Wabash and near by. The river itself was disappointing, because it was in high water. The collection of dragonflies which Mr. Williamson and his brother have gotten together is one of the best in the world, and we learned many pointers from observing their laboratory and field methods. Such precision, accuracy and care of detail are well worthy of copy.

After bidding a cordial forewell to Mr. Williamson and his family, we headed south again. We collected our first lot of *Goniobasis* in the Noland River, two miles west of Centerville, Ind. They were probably *G. semicarinata*, Say. After that, *Pleuroceridae* formed the greater part of our catch. We arrived at Bloomington on the night of the 25th in a pouring rain. It being too wet to make camp and cook a meal in any degree of comfort, we put up at a hotel and after supper took in the local movie and wrote up our field notes. This latter was always a

part of our evening duties, with a study of maps and a plan for the next day's trip.

It may be well here to mention how we kept field notes and cleaned our catch. As soon as we finished collecting at one spot, the entire catch was put in a can or bag and a slip of paper bearing a number put with it. Under the same number this entire lot of shells was entered in a field note-book, with full particulars as to ecologic data, etc. Here is a specimen entry:

"No. 103. *Pleurocera*, *Campeloma*, *Angitrema* and *Anculosa*. Little Tennessee River, Morganton Ferry, Tenn. Along muddy banks and on rocks and shoals. 8/22/24."

That, by the way, was one of the finest lots we ever collected. Our lot numbers ran serially from 1 to 145, the last collected on Sept. 4. On our next trip we shall start with No. 146. Every so often we filled the cans of the last few days' catch with alcohol, usually doing it in the evening. Then, next morning, one of us would stay in camp, empty out the alcohol and dry the lots separately in the sun, while the other collected. At the same time full labels were written out and the shells wrapped up and sent back to the museum as soon as enough for a box had accumulated. We used denatured alcohol, which, while not as good as pure alcohol, is cheap and readily obtainable locally. Later, if it is desired to examine the animal for radula, it can be soaked out. This end of the collecting was not much fun, but very necessary. We are setting it down because some one else may want to adopt it and improve on it. In accounts of collecting trips the authors usually neglect to state how the shells were cared for and sent back, and we have often wondered what methods were followed. John B. Henderson in his "Cruise of the Thos. Berrera" is one of the few exceptions.

Our methods of collecting were very simple. When you see the shells, go in after them. At first we used to pack them up along the edge, walking out on boards and so forth. But after a while we got so that we waded right in after them, shoes, puttees, and all, and our feet and lower limbs were continually wet from one stream to the next and from one day to the next. Yet we never once took cold on the whole trip. Back in camp

we used to put on dry clothes, but pull the wet ones back on in the morning. If the shells were pretty far out and were plentiful, we put on swimming trunks and old boots and went on out.

We struck no really good collecting until about ten miles south of Bloomington, Ind., and then every stream was thick with *Pleurocerids*, *Physa*, and often naiades. We took ten lots of *Pleuroceridae* between Clifty Creek, Columbus, Ind., and the Ohio River at Louisville. We stopped at Mitchell, Ind., a day to inspect the curious cave formations there. In an icy cold stream issuing from Donaldson Cave, we took a shell which resembled *Goniobasis semicarinata*, Say. In the cave itself we hoped to find blind fish, but saw only one and it got away. We did collect two small salamanders. From Mitchell south, the country became very rugged and beautiful, quite a contrast to the extreme flatness of central Indiana. The good ship "Asthma", however, never failed us, in spite of the load she was carrying. In the whole 1700 miles she never gave us any real trouble, although we did change tires seven times one day! But that was on the "boulevards" of Kentucky. It was with real regret that we sold the gallant little car in Knoxville. She should have been put to pasture like all noble steeds.

We collected a fine series of *Goniobasis indianensis* Pils. in the Blue River, taking lots at several points three or four miles apart. This is the type locality for that species. Here we also collected three specimens of what looks very much like an *Anculosa*, but will be determined later. The first stage of our trip ended at Louisville, where we got our accumulated mail, stocked up on beans again, and pulled out for Cave City, Kentucky.

For the first fifteen miles after leaving Louisville we struck concrete roads and were beginning to have a high opinion of Kentucky roads and the Dixie Highway in particular. Then we hit a detour, then more detour, worse than the last, and more of it for about sixty miles. When they repair a road in Kentucky they take the whole stretch at once. Words cannot express the meanness of those roads, and we were so busy "praising" them that we forgot to take pictures of them. We passed near Lincoln's birthplace, and now we know why he

left Kentucky. Furthermore we struck no collecting for about forty miles after leaving Louisville. In a way, we are grateful for those detours, though, because in taking one we were led to one of the richest collecting spots of the whole trip. As we were pounding along in the midst of the hills, we decided to stop a while and cool the engine. Right where we stopped we noticed a sign which said "Visit the dam and eat at Glenbrook Hotel," and an arrow pointing down. "Dam" sounded like water (though it was what we had been saying for many miles), and water meant shells, so down we went, and we certainly found shells. The dam and brook below were plastered with a small black *Goniobasis* and we also took several hundred fine *Physa microstoma* Say out of the pond above. They have dammed up a big spring there for power purposes. As there were also indications of land shells, we drove down and camped beside the hotel for two days while we collected. In the spring above and below the dam and in a neighboring spring we took several quarts of shells, taking care to keep the lots separate. I have never seen shells more plentiful in one spot except in First Creek at Knoxville. We also discovered to our surprise that we were only a hundred yards above Rio on the Green River, so we hastened to get a boat and collect in the river. The Green River, and it is green, was one of the places we wanted to hit, because it has not been collected in above Mammoth Cave to any extent. We took half a dozen species of *Pleuroceridae*, including *Anculosa*, and a fine lot of naiades. Also along the sides of the glen above the spring we found many land shells, *Omphalina*, *Polygyra* of many species, and others. So the detours were not an unmixed blessing; indeed, we found that to get the good shells, one must get off the good roads. So it was with a sense of time well spent that we left Rio.

At Cave City we sent our first shipment north, two big boxes, and then we went out of our way a few miles to see Mammoth Cave. It turned out that this word should be in the plural, for we found on arriving that there were half a dozen caves or more, many said to be more splendid than Old Mammoth. Acting on advice we had received, we spent a morning explor-

ing Great Onyx Cave and count it time well spent. Here also we collected a salamander, mole crickets, and a blind beetle. It was in one of these caves that Call discovered *Carychium stygium*, but we saw none. We also collected again in the Green River here, and then pulled out and set off for Nashville, Tenn.

There was not much collecting till we struck the Cumberland River just above Nashville, and here we took a fine lot of shells, finding *Angitrema* for the first time, big, spiny ones that looked like young *Io*. This was the only day we really suffered with heat and we finally stopped collecting to run into town and cool off at a soda fountain and read our mail. This ended the second stage of our trip.

From Nashville south to Huntsville, Ala. the collecting became very rich, every stream being loaded. It seems that the forecasts and reports of high water were not borne out, for in practically every stream we could wade across and see bottom. In fact, only once on the whole trip did rain so muddy a stream that we could not collect in it. It was an ideal summer from a conchologist's standpoint, for it rained scarcely once throughout the belt we collected in for the whole two months.

The Duck River, which we crossed at Shelbyville proved a big disappointment, for we found only one shell, a naiad. Doubtless this stream is polluted right there. But one mile south of Shelbyville, in a large tributary of Duck River, we found very good collecting. Here we took our first *Anculosa* in quantity, a nodulated species. They were in what we soon found to be their characteristic situation—on the edges or underside of flat rocks in very swift water, usually at the head of a riffle.

The Elk River, one mile south of Fayetteville furnished the best collecting we had so far found. Here from the river itself and from a small slough close by we took about three gallons of *Pleurocera* and *Anculosa*. We also began to get *Campeloma* from now on. A few days before, we took the first *Viviparа* of the trip along the marshy edge of a river one mile north of Murfreesboro. Shortly after leaving this locality we crossed the line into Alabama, and came on into Huntsville. This

town has been made famous by the work of many other collectors, notably H. E. Sargent, H. H. Smith and H. E. Wheeler. The latter in two excellent papers in the NAUTILUS gave a list of the shells of Monte Sano, a high plateau overlooking the town. Before going up Monte Sano we collected in the Big Spring in the heart of the town. This spring contained a puzzling species of *Goniobasis*, puzzling because Sargent had distributed it as *G. perstriata*. Goodrich recognized them as *G. nassula* and thought the two names might be synonymous. The shells we found were *G. nassula*, but we turned up the true *G. perstriata* in Spring Creek. It happened that the day we visited the spring men were cleaning out water weeds, so we simply sat down and leisurely picked a box full of the little fellows. In the afternoon we drove up Monte Sano through one of the two toll-gates left in Alabama and camped on top. Next day we devoted to scrambling over the mountain, and found many of the shells listed by Wheeler, but not all, for it had been an exceedingly dry summer and land shells seemed to be very scarce. For the first time in our experience we took *Helicina*. This ended the third stage of our journey.

Our next objective was Chattanooga, Tenn. It was a question whether to take the road up the north bank of the Tennessee, or the south bank. We finally decided on the latter because the road was reported much better. So we turned south till we hit the river at Whitesburg Ferry Landing. Here we found a great quantity of naiades embedded in new wash of the river, all clean, in perfect condition, nacre and hinge unharmed. We took a large series of each species. A little farther on we crossed the Flint River where we spent several hours collecting large numbers of *Vivipara*, *Campeloma*, *Anculosa*, and several species of *Goniobasis* and *Pleurocera*. The river was very muddy, but normally so, no doubt, because there was no trouble getting the shells. We put up for the night at New Hope and collected in Paint Rock River next day. In the deepest parts the river was only breast-high, rock bottom with a layer of silt or gravel, so we put on trunks and covered every foot of the bottom for a half mile. We are quite sure we got every species there, and a nice lot it was. As usual there were

two distinct species of *Pleurocera*, probably more; one, a squat, heavy form found on rocks, the other a longer, slender species found on mud and on logs. We recognized among the naiades such old friends as *Proptera alata* Say and *Leptodea fragilis* Raf. We crossed the Tennessee at Guntersville, turned west over Bear Mountain and then headed north. Albertsville, Ala., was the farthest south we reached. There was very little further collecting till we reached Chattanooga, and in this respect we were sorry we did not take the northern road. The only notable collecting was a good series of a fine, large *Pleurocera* from Lookout Creek about four miles north of Valley Head. On Aug. 13 we rounded Lookout Mountain and entered Chattanooga. This ended the fourth stage of our trip.

At this point Paul J. Adams of Knoxville, Tenn. joined the expedition as an additional collector and stayed with us till the end of the trip. His knowledge of the country around Knoxville and the Great Smoky Mountains was extremely useful to us and enabled us to cover much more ground that we otherwise would have. On the other hand we were able to show him wrinkles about the "shell game," which were new to him. We now began to strike more of the localities which Mr. Goodrich had suggested as desirable to visit, either because these were type localities or represented only by puzzling and inadequate material. We laid out our course especially to hit such places. The first of these was Chickamauga Creek at Lee and Gordon's Mill, just outside the military park. The reason for visiting this was to check up with material from Crawfish Springs in the park which was the type locality for *Pleurocera planicostata*. We found shells plentiful there and collected several quarts. We then drove west to reach the Conasauga River, which is the type locality for eight species of *Goniobasis* alone. We were also anxious to collect in this river because it belongs to the Gulf drainage and for that reason presents a different fauna from that of the Tennessee. The shells did indeed look different from any we had so far seen and we took large lots from two places on the Conasauga, as well as Mill Creek, Coahuila River and several other streams. We recognized among these *Goniobasis murrayensis* Lea—this is its terri-

tory. By accident, while buying postcards in Dalton, Ga., we saw a picture of "Country Club Lake", which was not on the map. Arriving there we found a fine large *Pleurocera* of the lake type. Mr. Goodrich is now working at identifying all this material.

A few miles beyond Dalton we turned north again into Tennessee and went out of our way to visit the Ocoee River dam at Parksville. This dam has backed up the river for ten miles and made a large inland lake; we were interested to see what the shell life would be and we also wanted to collect in the Ocoee, as no shells have been reported from there recently, if at all. We found out why; there *are* no shells in the river. We learned that farther up the river near Ducktown, sulfuric acid was produced as a waste in zinc smelting, and run off into the river. This has completely killed all forms of water life, not even a fish being found. This affects even the Hiwassee River, into which the Ocoee flows, so that we found no shells in either. It was a somewhat new experience, for we had grown so used to finding shells in every creek that we had acquired the habit of piling out of the car, grabbing an empty can and wading right out. At times it almost got monotonous. We climbed a small mountain, Sugar Loaf Hill, beside the dam and found quite a few of the smaller land shells at 1100 feet.

From the dam we drove west to Cleveland, Tenn. There was a *Goniobasis* reported many years ago from a "spring near Cleveland on road to Ducktown" which we wanted to look up, and we also wanted to investigate a small lake, also called "Country Club Lake", shown on the map near the town. We reached the lake just before dark and pitched camp in a grove of pines, the most ideal camping spot of the trip. Next morning we collected thoroughly in the lake and in its inlets and outlets, and took two fine *Goniobasis* and a beautifully-ribbed *Pleurocera* in great quantity. We found a few naiades also. Our catch here was particularly interesting as the lake drains into the Conasauga River. In fact, the ridge just back of the lake was the dividing line between the Conasauga and the Tennessee drainages. About noon we started a hunt for the elusive spring and found it without much trouble. There were a few

of the *Goniobasis*, which we gathered, but did not linger long, for the water was icy cold and quite deep, and typhus was reported by the local hospital.

We now headed north for the Tennessee River at Loudon, which we reached at dusk. Here, at Sam's Island, Dr. C. C. Adams reported large numbers of *Io*, form *loudenensis*, and we were all on fire to diminish the local race. Next morning we borrowed a boat and went down river. At once we began to find *Strephobasis*, *Angitrema*, *Anculosa*, and several *Pleurocera* and *Ancylus*. But no *Io!* The Tennessee was still a little high, however, and we might have had better luck a month later. Finally, one of us did find the first *Io* of the trip, a fine, big *loudenensis*; and he at least will always remember the thrill he felt when he put his hand on those big spines. The thrill never wears off with *Io* even when we later collected several hundred in a day. Although we felt the bottom barehanded for many yards around that spot, a swift rocky shoal, we found no more. So a little after noon we drove north again to Lenoir City where our mail awaited us, stocked up on beans again, and drove northward till we struck the Clinch River at Riley Ferry, not many miles above the mouth. Here again we took only a lone *Io*, but a wonderful catch of naiades, many species, some of which were old friends. Although we saw ideal situations for *Io*, we could find none. Perhaps this is because we had not yet learned how to look for them, or because until the water is very low, they are quite dispersed. There is a trick to *Io* collecting. Later we found the most plentiful on fairly swift shoals, at the head of the riffles and at the end, just under the edges of rocks and smooth ledges, usually spire pointing down stream. Never in water over three feet deep, sometimes partly out of water. This is surely the queen of fresh-water shells.

During the next day we made a loop to the north and collected *Goniobasis* and *Physa* in Bear Creek, Poplar Creek, and several springs, coming out on the Clinch again at Emory River. We camped here and made extensive collections on the shoals, again bagging a lone *Io*, but many *Anculosa*, some knobbed, *Angitrema*, *Strephobasis*, etc. The *Anculosa* were particularly large and fine here.

Leaving Kingston, we struck west to run down another doubtful locality, Cane Creek and Toco Creek near the North Carolina line. We eventually found both of these and neither had any shells at that point. The rapid deforestation has changed the character of these creeks and given them a shifting, sandy bottom unfavorable to shells. Such is liable to be the fate of many other streams; and many others are being dammed for power, also changing the shell life. So they should be surveyed as soon as possible. In getting to these creeks, we followed the Little Tennessee and were amply repaid for our trouble by the rich collecting we got along it. At Coytee Shoals we found *Angitrema*, *Physa*, *Unios*, *Sphaerium*, and a very diocollated *Pleurocera*, while a few miles farther at Morgantown Ferry we made one of our richest hauls—700 very large, fine *Campeloma*, probably *C. coarctatum* Lea, over 1000 specimens of a giant *Pleurocera* nearly two inches long, and the usual run of *Anculosa*, etc. Although we hunted carefully we found no trace of *Io* in this river, though conditions seemed ideal and some of the natives reported finding "spiny shells" on the shoals. Dr. C. C. Adams and his collectors reported the same lack of success. It would be interesting to follow this up and see if there are any in the head waters.

We examined the Tellico River at two places near Vonore and found a few *Pleurocera*, then headed west again for Sweetwater. Sweetwater Creek was one of the localities we wanted to check up on. It is polluted below the town, but we struck it just above the town, near the pumping station, and not only took a large series of *Pleuroceridae* from the creek itself, but also collected several kinds of *Goniobasis* from Cannon Spring and a small pond close by. This was a good haul.

We now continued north to Lenoir City again, collecting in Turkey Creek en route, and ferried over the Tennessee. We wanted to run into Cades Cove, and climb one of the peaks of the Great Smoky Mountains. This would enable us to cut Little River in many places. We certainly did survey the latter river thoroughly, for we took eight lots out of the river from points extending from near the mouth almost to the source. Our trip into Cades Cove and the hike up Thunder-

head is one of the high lights of the summer. The road into the Cove, while in good shape, is surely the crookedest road in the world, for its length. Coming out we counted 226 turns in ten miles, many of the hairpin variety. This was Paul J. Adams' old stamping ground, and we left our machine in the barn of a friend of his, made up our packs and started on the hike up. These mountains are the highest east of Rockies, and though this one was only about 5,500 feet elevation (Thunder Head), it seemed much more before our tired legs reached the top. The going was made a little easier by picking up an occasional *Polygyra andrewsi* Binn. A dozen of these will fill your pack. Next to *P. chilhoweensis* Lewis, also found in these mountains, this is the queen of the *Polygyras*. Adams assured us that in a wetter season, land shells would have been much more plentiful. We saw far too few. We made the top in a cold fog, and hastened to seek shelter in the cabin of a cattle herder, old Tom Sparks, another friend of Adams. Early in the morning we tumbled out and went up the crown of the mountain just over the North Carolina line where we got a superb view of the rugged peaks. Then back for a hasty breakfast and the long pull down which seemed even harder on the legs than the hike up. Shortly after noon we got back to the car, packed up and pulled out. In packing we missed a bag containing two dozen eggs we had just bought and concluded the farmer's dogs must have gotten them. About a week later, Clench, after much complaint from the other two on the condition of his duffle bag, decided to clean it out and found the whole two dozen where the farmer had put them to be out of reach of his dogs! Curtain! We are still laughing at that.

We now turned north to Knoxville, stopping just once to collect several quarts of big *Pleurocera* from Nale Creek. We were in a hurry now because Clench felt an attack of his old malaria, contracted the previous summer, coming on. When we reached Adams' home in Knoxville, Clench was just able to wobble up to bed. Strong doses of quinine brought him around, however, and two days later he was out collecting again. We cannot express enough gratitude for the kindness and hospitality which the Rev. Mr. and Mrs. Adams showed us then and later.

As soon as Clench was over his attack we made a trip to the Holston River in company with the veteran collector Manley D. Barber, a resident of Knoxville and Rev. Mr. Adams. Mr. Barber promised us some *Io* on a shoals about twelve miles up the Holston, and was able to make good on his promise. For the first time we took *Io* in some quantity, nearly 200, as well as many other shells. These Ios were big spiny fellows, possibly typical form *spinosa*. On the way back we collected in Swan Pond Creek and had very good success. While waiting for Clench to get well, trips were made to the Tennessee River, with poor success, and to First Creek with wonderful luck. At the latter place, although the stream was quite cluttered with rubbish, the water was literally crowded with *Pleurocerids*. Never have we seen shells in such quantity. We filled up all our cans and buckets in a short time—we could have filled barrels—and then turned home. It would pay to make a complete survey of that stream, it is so rich, and we hope Adams will do it. Another bit of collecting we did in Knoxville was a search for land shells at Cherokee Bluffs and for *Helix nemoralis* Linn., introduced near the campus of the University of Tennessee. About 100 live specimens of the latter were carried to St. Louis by Remington and "planted" on the grounds of the Principia School.

On Aug. 30 we left Knoxville on the last leg of the trip. Our intention was to collect farther up on the Clench and the Powell and perhaps run into Virginia. We were going after *Io* in quantity now. Leaving Knoxville we collected in Second Creek, Knob Fork Creek and Beaver Creek, and struck the Clinch at Clinton. Here we collected a big series of *Campeloma* and *Pleurocera*. A few miles beyond we again hit the Clinch at the old Moore's Ferry and found the usual run of shells, in quantity, and about 100 *Io*, small, of the form *brevis*. We now headed for the mouth of the Powell River where we wanted to get a big series, as there is some talk of a dam being built there. We found a few *Io* here in both the Clinch and Powell, as well as some fine *Strephobasis*, *Anculosa*, naiades, and the river forms of *Pleurocera*.

Another stop was made on the Clinch near Maynardsville,

Tenn. where we secured a fine catch of mussels. Then we made a detour to strike the Powell near Cumberland Gap, and had very good success there. For the first time we took over 100 *Io* which were nearly smooth. It would be hard to say what these shells are, as they intergrade, but they range between form *lyttonensis* and form *powellensis*. We kept zigzagging between the Powell and the Clinch here, until we turned northeast at Tazewell toward Kyle's Ford on the Clinch. A collection made in the Little Sycamore Creek was remarkable for having a few *Anculosa* in it, as well as some forms of *Pleurocerids* new to us. *Anculosa* were not usually found in small creeks. This day we made camp just before a pelting rain caught us. We saw the storm coming and stopped at the first handy spot, but quickly moved after the storm when we found we were camped close to a very dead calf! Once before we found we had camped near a departed mule. We favor a law in Tennessee requiring farmers to bury deceased animals.

We came out on the Clinch about six miles below Kyle's Ford, Tenn. and proceeded to collect all the way up to the ford. The river here is a series of shoals, quite clear, and we could see the Ios on the ledges. At Kyle's Ford they were particularly thick, as many as ten being brought up in one scoop of the hand. These Ios are from the type locality for the form *brevis*. It was thrilling work, though back-breaking, to grope for shells and keep a footing in the swift water. But our long-awaited dream of collecting *Io* had come true and we chalked off another aim achieved in conchology. We still have a few left. This was the last collecting we did, for our funds were almost exhausted and our time was about up too. Indeed, we had stretched the appropriations for two so as to cover expenses for three, and we considered that good managing. On Sept. 5, we drove back to Knoxville. All that remained now was to dispose of the car, pack our outfit and take the train back to Ann Harbor. The Rev. Mr. Adams kindly took the car off our hands and we were glad to know it was with friends. We feel very tender toward that car. On Sept. 8 we reached Ann Arbor again, having stopped in Detroit a few hours to report to Dr. Walker and spent a pleasant hour with him.

Our work, while very scattering, did approach completeness on the Little and Clinch Rivers—we collected at eleven stations on the latter river. As the upper reaches of the Clinch have been explored by Goodrich and Ortmann, the Clinch may be said to be thoroughly explored now. We estimated that we brought back over 250,000 specimens. Dr. Walker says no such volume of work has ever been done on the *Pleuroceridae* at one time. The whole work was really in the nature of a survey, and when the results are made clear, will furnish a basis for further work later. We want however, to give the Ios time to come out of their hiding places again. It is reported that the canned-bean industry had a big year! A wonderful trip, vagabonding for shells!

PUBLICATIONS RECEIVED

Pelecypoda from the Marine Oligocene of Western North America. By Bruce L. Clark (Univ. Calif. Pub., Bull. Dept. Geol. Sciences, Vol. 15, No. 4, pp. 69–136, pls. 8–22, 1925). Forty-four new species are described and figured with notes and figures of many others.

The fossils of the Lower San Pedro Fauna of the Nob Hill Cut, San Pedro, California. By T. S. Oldroyd (Proc. U. S. Nat. Mus., Vol. 65, Art. 22, pp. 1–39, pls. 1–2, 1924). Twenty-two new species and subspecies are described from this Pleistocene formation which contains some 242 species of shells.

Discovery of a Balkan Fresh-water Fauna in the Idaho Formation of Snake River Valley, Idaho. By W. H. Dall (U. S. Geol. Survey, Prof. Paper 132-G, pp. 109–115, pl. 26, Nov., 1924). Seven new species, including four of the remarkable genus *Orygoceras* are described. A new genus *Payettia* is proposed, type *Latia dalli* White.

Opisthobranchiate Mollusca. By Frank M. MacFarland (Proc. Cal. Acad. Sci., 4 Ser., Vol. 13, pp. 389–420, pls. 10–12, Nov., 1924). One new species *Aglaja bakeri* and a new genus *Tridachiella*, type *Tridachia? diomedea* are described and figured.